



Databases and SQL

The Bioinformatics Lab SS 2013 - Wiki topic 10

Tikira Temu

04. June 2013

Outline

1 Database system (DBS)

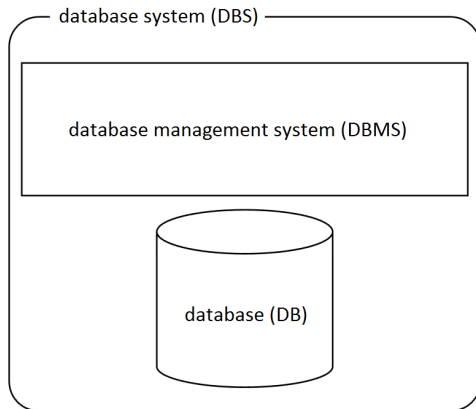
- Definition DBS
- Definition DBMS
- Advantages of a DBMS
- Famous DBMS

2 MySQL Database (DB)

- Some facts about MySQL DB
- Ways to access a MySQL DB
- MySQL statements
- Ways to backup a MySQL DB
- Restore the backup

Database system (DBS)

- Def:
Electronic system for data management
- Goal:
Safe huge amount of data in a efficient, consistent and durable way
- $DBS = DBMS + DB$



Database management system (DBMS)

- (Complex) software system
- Interface between DB and users/applications
- Functions
 - Safe, modify, delete data
 - Maintenance of DB and metadata
 - Determines a database model
 - Most common form is relational DBS
 - Administration
- Uses database language like SQL

Advantages of a DBMS

- Security management
- Enables multi-user access control
- Reduction of data redundancy
- Maximizing data consistency (trigger and stored procedures)
- Transaction Management
- Provides backup and recovery

Famous DBMS

- Oracle (Oracle Corporation)
- SQL Server (Microsoft)
- PostgreSQL (Freeware)
- SAP (SAP)
- DB2 (IBM)
- SQLite (SQLite)
- MySQL (Freeware)

Some facts

- Open source relational database management system (RDBMS)
- Initial release in 1995
- Developer(s): Oracle (formerly Sun, formerly MySQL AB)
- written in C, C++
- Transaction- and ACID conform
- Supported platforms: many Linux versions, Mac OS, Windows, Oracle Solaris,....



Ways to access a MySQL DB

- Command line

MySQL monitor

Usage: mysql [OPTIONS] [database]
mysql -u user -p password

- Programming languages (e.g. Java, Perl, Python,...)

Perl example

```
use DBI;  
$db = DBI->connect('DBI:mysql:db_name;host=localhost',  
'user_name', 'password', { AutoCommit => 0 } );  
$db->do('CREATE TABLE myTable (id INT, value  
VARCHAR(100))');  
$db->disconnect;
```


Ways to access a MySQL DB

- Web-based (e.g. phpMyAdmin)

phpMyAdmin example

```
$link = mysql_connect('mysql_host', 'mysql_user',  
'mysql_password') or die('...' . mysql_error());  
mysql_select_db('my_database') or die ('...');  
$query = 'SELECT * FROM my_table';  
$result = mysql_query($query) or die ('Query failed: ' .  
mysql_error());  
mysql_close($link);
```

- GUIs (e.g. MySQL GUI Tools)

MySQL

Common workflow of creating a database:

- 1 Create database/schema
- 2 Create tables
- 3 Fill tables with information
- 4 Create indices for non primary keys
- 5 Create users
- 6 Give privileges to users

Some useful SQL statements:

- **CREATE** DATABASE/
TABLE/INDEX/USER
- **ALTER** DATABASE/TABLE
- **DROP** DATABASE/
TABLE/INDEX/USER
- **RENAME** TABLE/USER
- **GRANT, REVOKE,
SET PASSWORD**

Ways to backup a MySQL DB

■ Command line tools

mysqldump

```
mysqldump [options] db_name [tbl_name ...]  
mysqldump [options] --databases db_name ...  
mysqldump [options] --all-databases  
mysqldump -u user -p password dbname > dumpfilename
```

mysqlhotcopy

```
mysqlhotcopy db_name [/path/to/new_directory]  
mysqlhotcopy db_name_1 ... db_name_n /path/to/new_directory  
mysqlhotcopy db_name./regex/  
mysqlhotcopy -user user -password=yourPassword db_name  
/path/to/new_directory
```

Ways to backup a MySQL DB

- MySQL monitor:

After logging in

```
SELECT * INTO OUTFILE|DUMPFILE file_name FROM  
db_name.table_name;
```

The file can be found in
/var/lib/mysql/db_name/file_name

Restore the backup

Command line

```
mysql -u user -p password db_to_restore < backupfilename
```

References

- [1] Definitions for DB and DBMS
- [2] Functions of a DBMS
- [3] List of DBMSs
- [4] MySQL
- [5] Perl module DBI
- [6] MySQL API for php
- [7] MySQL GUI Tools Manual
- [8] Account Management Statements (MySQL Manual)
- [9] mysqldump (MySQL Manual)
- [10] MySQL backup and restore
- [11] Mimer SQL-2003 Validator



for your attention!